Timing is Everything

Avoid subsoiling dry soils to slash power requirements

BY DARRELL SMITH

Sidestep subsoiling when soil is extremely dry and you can zap the horsepower required by more than 25%—and still shatter the hardpan layers. That's one of several lessons from two subsoiling studies conducted by researchers at the USDA–Agricultural Research Service (ARS) National Soil Dynamics Laboratory (NSDL) in Auburn, Ala.

Subsoiling is not a new practice; however, many questions about it—such as why some soils respond more than others or respond better to a certain type of shank—continue to intrigue farmers and researchers. "The advent of new subsoiler shanks, designed for conservation tillage, raises even more questions," says USDA–ARS ag engineer Randy Raper.

The draft force requirement study was conducted at NSDL's indoor laboratory with Norfolk sandy loam, a Coastal Plains soil.

Raper and his colleagues measured the force required to break up a hardpan layer and the amount of soil disturbance created by a traditional straight subsoiler shank and conservation-tillage shank. The team of scientists tested four soil moisture levels: wet (16.3% moisture or field capacity), moist (13.3% moisture, dried for one week), dry (8.3% moisture, dried for two weeks) and very dry (5.8% moisture, dried for five weeks).

The researchers attached each shank to a dynamometer to measure the force required to pull it through the soil. They found disruption of the hardpan was satisfactory with both shanks in all moisture conditions. There was little difference in force requirements—except in very dry conditions. There, horsepower requirement increased by more than 25% for both shanks.

Based on the study, Raper says, "the ideal condition for subsoiling is when soil is moist or dry. Try to avoid the extremes, either wet or very dry." Although force requirements are low in wet soil, saturated soil is easily compacted, and vehicle traffic may do more harm than good, he adds.

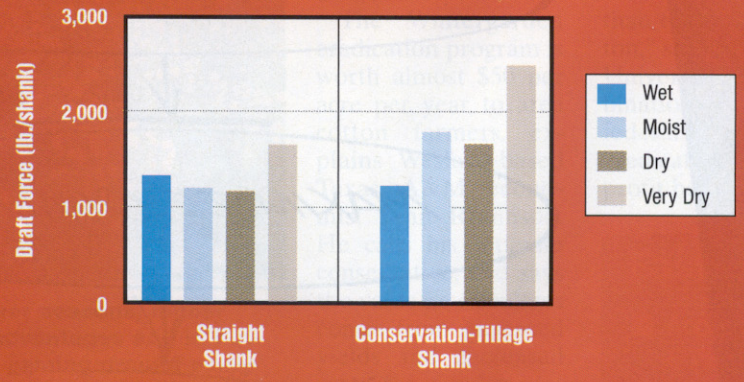
The second study was conducted in the Tennessee River Valley region of northern Alabama. The goal of this study was to learn how often subsoiling is required. It compared three popular subsoiler models (with no other tillage) against no-till. Previous studies had shown occasional benefits from in-row subsoiling.

The field contained Dewey silt loam, and had grown conventionally tilled cotton for several years. A compacted layer was found at 12", so the machines were run 13" deep.

The scientists subsoiled every year, every two years, every three years and not at all. A rye cover crop was included in all treatments. Because a previous study had shown that no-till with a cover crop yielded as well as conventional tillage, no conventional tillage treatment was included.

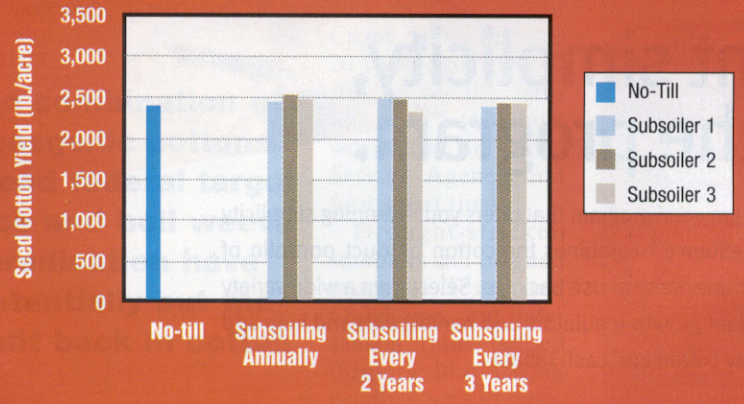
The scientists found only small differences in cotton yield between no-till and subsoiling at any interval, with any tool. "The study showed that, in this soil, there is no need for routine subsoiling if you no-till and grow a rye cover crop," Raper says. FJ

Draft Force Required to Subsoil in Various Soil Conditions



Comparing two types of subsoiler shanks across four soil moisture levels, scientists found very little difference in force requirements, except in very dry soil, which required about 25% more horsepower.

The Impact of Subsoiling on Cotton Yields



Soils vary in their response to subsoiling, but the operation performed at one-, two- and three-year intervals had no impact on cotton yield because a rye cover crop eliminated compaction. This study was conducted in the Tennessee River Valley of northern Alabama.

SOURCE: USDA–AGRICULTURAL RESEARCH SERVICE